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Oct 9, 2001

US-PAT-NO: 6300379

DOCUMENT-IDENTIFIER: US 6300379 B1

TITLE: Production of stable hydrolyzable organosilane solutions

DATE-ISSUED: October 9, 2001

INVENTOR-INFORMATION:

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US-CL-CURRENT: 516/55, 106/287.1, 106/287.11, 106/287.12, 106/287.13, 106/287.14,
106/287.15, 252/182.11, 516/53

CLAIMS:

What I claim is:

1. A method of improving the physical and chemical stability of an aqueous solution containing a quantity of an organosilane of the formula A.sub.3-x B.sub.x SiD provided that the organosilane fails to form a clear solution in water at 25.degree. C. at the intended level of use of the organosilane, the method comprising:

including within the aqueous solution

a surfactant selected from the group consisting of cationic surfactants, non-ionic surfactants, amphoteric surfactants and mixtures thereof, and

at least 1% by weight based on the total weight of the aqueous solution of a glycol ether co-solvent to improve the physical and chemical stability of the aqueous solution,

wherein the co-solvent has a solubility in water at 20.degree. C. in the range of 1 to 25%, and A is --OH or a hydrolyzable group, B is a substituted or unsubstituted alkyl group of from 1 to 4 carbon atoms, x has a value of 0, 1 or 2, and D is a substituted or unsubstituted hydrocarbon group.

2. The method of claim 1 wherein:

A is an alkyl ether group.

3. The method of claim 2 wherein:

A is an alkyl ether group having a lower alkyl group having 1 to 4 carbon atoms.

4. The method of claim 1 wherein:

D is a hydrocarbon group including at least one fluorine substituent.

5. The method of claim 1 wherein:

D is a hydrocarbon group containing from 6 to 18 carbon atoms.

6. The method of claim 1 wherein:

the organosilane has the formula $R_f-X-Si(OR)_3$ wherein R_f is a perfluoroaliphatic group, X is a linking group containing an unsubstituted lower alkylene group, and R is methoxy or ethoxy.

7. The method of claim 1 wherein:

the quantity of the organosilane in the aqueous solution is 0.01% to 3% based on total weight of the aqueous solution.

8. The method of claim 1 wherein:

the surfactant is included in the aqueous solution in the range of 1% to 10% by weight based on the total weight of the aqueous solution.

9. The method of claim 1 wherein:

the amount of co-solvent included in the aqueous solution is in the range of 1% to 9% by weight based on the total weight of the aqueous solution.

10. The method of claim 9 wherein:

the amount of co-solvent included in the aqueous solution is in the range of 4% to 9% by weight based on the total weight of the aqueous solution.

11. The method of claim 9 wherein:

the co-solvent is selected from the group consisting of propylene glycol n-butyl ether, dipropylene glycol n-butyl ether, and dipropylene glycol n-propyl ether.

12. A method of improving the physical and chemical stability of an aqueous solution containing 0.01% to 3% by weight of an organosilane of the formula $A_{sub.1-x}B_{sub.x}SiD$ provided that the organosilane fails to form a clear solution in water at 25.degree. C. at the intended level of use the organosilane, the method comprising:

including within the aqueous solution

from 1% to 10% by weight based on the total weight of the aqueous solution of a surfactant selected from the group consisting of cationic surfactants, non-ionic surfactants, amphoteric surfactants and mixtures thereof, and

from 1% to 9% by weight based on the total weight of the aqueous solution of a glycol ether co-solvent to improve the physical and chemical stability of the aqueous solution,

wherein the co-solvent has a solubility in water at 20.degree. C. in the range of 1 to 25%, and A is --OH or a hydrolyzable group, B is a substituted or unsubstituted alkyl group of from 1 to 4 carbon atoms, x has a value of 0, 1 or 2, and D is a substituted or unsubstituted hydrocarbon group.

13. The method of claim 12 wherein:

A is an alkyl ether group.

14. The method of claim 13 wherein:

A is an alkyl ether group having a lower alkyl group having 1 to 4 carbon atoms.

15. The method of claim 12 wherein:

D is a hydrocarbon group containing from 6 to 13 carbon atoms and including at least one fluorine substituent.

16. The method of claim 15 wherein:

the organosilane has the formula $R_f-X-Si(OR)_3$ wherein R_f is a perfluoroaliphatic group, X is a linking group containing an unsubstituted lower alkylene group, and R is methoxy or ethoxy.

17. An aqueous composition obtained by the method of claim 1.

18. An aqueous composition obtained by the method of claim 7.

19. An aqueous composition obtained by the method of claim 12.

20. An aqueous composition obtained by the method of claim 16.